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540,701

Fig. 1.

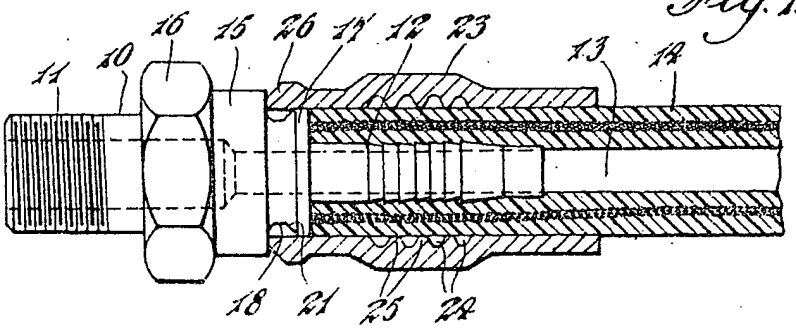


Fig. 2.

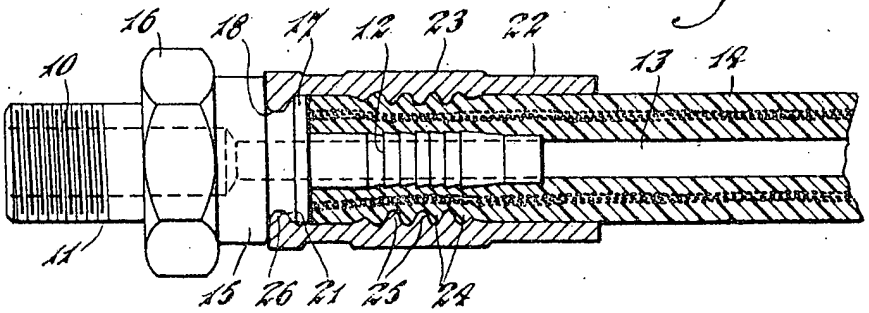


Fig. 3.

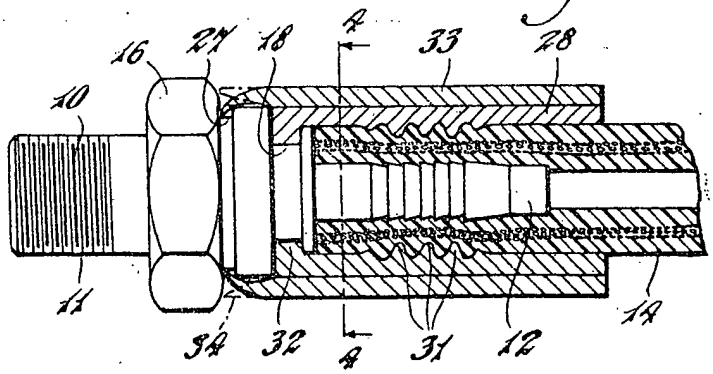
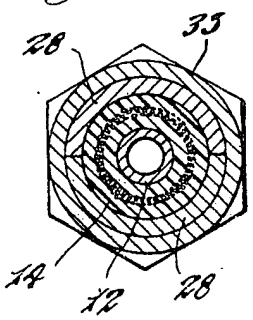


Fig. 4.



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AMENDED SPECIFICATION

Reprinted as amended in accordance with the Decision of the Superintending-Examiner, acting for the Comptroller-General, dated the twenty-eighth day of October, 1942, under Section 11, of the Patents and Designs Acts, 1907 to 1942.

PATENT SPECIFICATION

Application Date: July 18, 1940. No. 11865/40. **540,701**

Complete Specification Left: Feb. 4, 1941.

Complete Specification Accepted: Oct. 27, 1941.

PROVISIONAL SPECIFICATION

Improvements in or relating to End Fittings for Flexible Hoses

We, AUTOMOTIVE PRODUCTS COMPANY LIMITED, a British Company, of Brock House, Langham Street, London, W.1, and CYRIL DANIEL WATSON, a British Subject, of the Company's address, do hereby declare the nature of this invention to be as follows:—

This invention relates to end fittings for flexible hoses, and more particularly for hoses such as are used in liquid pressure braking and remote control systems, which are required to stand high pressures.

The principal objects of the invention are to provide an end fitting which is simple to manufacture and which substantially prevents fluid passing through the hose from coming into contact with the end surface of the hose.

According to the invention, a hose end fitting to which the hose is secured by radially inward compression of an outer sleeve to grip the hose between the said sleeve and a tubular member located in the bore, is characterised by the feature that the outer sleeve is separate from the end fitting and is secured thereto by radial compression into a circumferential groove in the end fitting.

The outer sleeve may be in one piece and formed initially with two externally thickened portions, and may be assembled with the hose and end fitting and passed through a swaging die, the thickened portions being thereby compressed inwardly, one to grip the hose between itself and the tubular member located in the bore, and the other to enter the circumferential groove in the end fitting and secure the sleeve thereto. Alternatively, the sleeve may be split longitudinally and provided with an inwardly directed flange at one end, the split sleeve being assembled round the hose and end fitting with the flange opposite the circumferential groove in the latter, and compressed radially over the sleeve. The split sleeve may be in one, two or more parts. The tubular member located in the bore of the hose is preferably integral with the end fitting.

In one form of the invention the end fitting is tubular, having at its outer end an externally threaded portion for the attachment of the hose to a pipe union or the like; at its inner end the tubular member or nipple which enters the bore of the hose, and between these an enlarged portion formed for part of its length with a hexagonal outer surface to receive a spanner for holding the fitting during manipulation of the hose. Adjacent the nipple, the enlarged portion of the end fitting is slightly reduced in diameter, and at the junction of the two diameters a circumferential groove is formed. The groove is bounded on the side nearer the nipple by an inclined wall, so that it is of trapezoidal shape in cross section.

The outer sleeve is substantially cylindrical, and has an externally thickened portion intermediate its ends, the inner surface of the sleeve at this thickened portion being conveniently formed with a plurality of circumferential grooves. A second externally thickened portion is formed at one end of the sleeve.

The end fitting is assembled on the hose by passing the hose end through the sleeve, pushing the nipple into the bore of the hose, and bringing the thickened end of the sleeve up against the shoulder on the end fitting formed by the reduction in diameter at the groove. The reduced part of the end fitting between the groove and the nipple is of a diameter substantially equal to that of the exterior of the hose, and the interior of the sleeve, and thus locates the latter on the end fitting.

The assembled fitting is then passed through a swaging die which compresses the two thickened portions of the sleeve

inwardly, the intermediate thickened portion gripping the hose by compressing it between the sleeve and the nipple, whilst the end thickened portion is forced into the groove on the end fitting, thus securing the sleeve firmly to the latter. The inward compression of the intermediate thickened portion of the sleeve causes the ridges between the grooves formed on its internal surface to project inwardly and form ribs, thus improving the grip of the sleeve on the hose.

In another form of the invention, the end fitting resembles that above described, but is provided with a second groove between that adjacent the nipple end, and the hexagonal portion. The sleeve is divided longitudinally into two or more parts. The sleeve is formed at one end with an inwardly directed flange, and intermediate its ends with an internally thickened and ridged or serrated portion. A further sleeve of plain cylindrical form with one end tapered internally is adapted to be drawn over the segmental sleeve by a convenient drawing tool to compress the segmental sleeve radially inwardly. The thickened serrated portion of the segmental sleeve thus grips the hose between itself and the nipple, and the inwardly directed flange of the sleeve is forced into the groove on the end fitting adjacent the nipple, thus securing the parts together. The end of the outer sleeve may then be peened over into the second groove on the main body of the end fitting to lock it in position. The split sleeve may be in one piece, with a single longitudinal split along its length.

As the nipple is formed integral with the main body of the fitting, liquid is unable to find its way between these two parts and come into contact with the end of the hose. It has been found that if liquid does reach the end of the hose it saturates the cotton or other threads forming the reinforcement of the hose and tends to weaken them, and it is therefore a considerable advantage to ensure that no liquid can reach the exposed threads at the ends of the hose.

The nipple may be separate from the main body of the end fitting, being for instance formed by a tube having an end flange, the tube being passed through the main body of the fitting from the outer end and its flange resting on a shoulder in the bore of the main body. The joint between the nipple and the main body of the hose end fitting may be rendered fluid-tight by soldering or brazing the nipple in place. For instance, the end face of the main body from which the nipple projects may be slightly countersunk around the aperture, the countersunk recess being filled with solder or spelter when the nipple is in place. The outer end of the main body may be internally threaded or externally threaded as required, or may take any other form convenient for the attachment of the hose to another component.

Dated this 18th day of July, 1940.

For the Applicants:
F. J. CLEVELAND & COMPANY,
Chartered Patent Agents,
29, Southampton Buildings,
Chancery Lane, London, W.C.2.

COMPLETE SPECIFICATION

Improvements in or relating to End Fittings for Flexible Hoses

We, AUTOMOTIVE PRODUCTS COMPANY LIMITED, a British Company, of Tachbrook Road, Leamington Spa, in the County of Warwick (formerly of Brock House, Langham Street, London, W.1), and CYRIL DANIEL WATSON, a British Subject, of the Company's address, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to end fittings for flexible hoses, and more particularly for hoses such as are used in liquid pressure braking and remote control systems, which are required to stand high pressures.

Such fittings comprise a portion projecting beyond the end of the hose itself for engagement with and attachment to an appropriate fitting, a nipple passing into the bore of the hose, and a sleeve surrounding the end of the hose, the hose being gripped between the nipple and sleeve to hold the end fitting thereon, and the invention relates to a fitting of the kind in which the nipple is integral with the projecting portion or is secured thereto in a fluid-tight manner, and the sleeve is a separate member which is made to grip the hose and at the same time is secured to the other part of the fitting by a single pressing operation.

In a hose end fitting of this kind which has previously been proposed, the sleeve has been split longitudinally into a plurality of parts, these being forced inwards by a surrounding strap or clamp which incorporate tangential bolts for tightening it around the sleeve.

The principal objects of the invention are to provide an end fitting which is simple to manufacture, and which substantially prevents fluid passing through the hose from coming into contact with the end surface of the hose.

In a hose end fitting of the kind referred to, having the outer sleeve circumferentially continuous and formed with externally thickened portions extending circumferentially around it, one of said thickened portions being at one end and the other intermediate the ends, the invention is characterised by the fact that, after the end fitting has been assembled on the hose, the sleeve is passed axially through a swaging die to compress the thickened portions inwardly, one to grip the hose and the other to enter a circumferential groove in the main part of the end fitting and secure the sleeve thereto. Alternatively, where the sleeve is split longitudinally and formed with an inwardly directed flange at one end and with a series of internal ridges intermediate its ends, the sleeve is compressed radially inwardly on to the hose by means of a second sleeve forced longitudinally over it to cause the internal ridges to grip the hose and the end flange to enter the groove on the main part of the end fitting. The split sleeve may be formed in at least two separate parts, and the second sleeve may be tapered internally at one end to enable it to be readily passed over the split sleeve.

It is not held that there is any novelty in the idea, *per se*, of securing the sleeve to the main part by grooving the latter circumferentially and forming upon the sleeve an internal flange which engages said groove.

The invention is hereinafter described with reference to the accompanying drawings, in which:—

Figure 1 is a sectional view of one form of hose end fitting according to the invention with the parts assembled but before the sleeve has been compressed inwardly;

Figure 2 is a corresponding view showing the sleeve compressed;

Figure 3 is a sectional view of another form of hose end fitting according to the invention in a completed state; and

Figure 4 is a section on the line 4—4 of Figure 3.

In the form of the invention shown in Figures 1 and 2 the main part of the end fitting comprises the projecting portion 10 which is externally threaded at 11 for the attachment of the hose to a pipe union or the like, and the nipple 12, which enters the bore 13 of the hose 14, the projecting portion and nipple being connected by an enlarged portion 15 formed for part of its length with a hexagonal outer surface 16 to receive a spanner for holding the fitting during manipulation of the hose. Adjacent the nipple, the enlarged portion of the end fitting is slightly reduced in diameter at 17, and at the junction of the two diameters a circumferential groove 18 is formed. The groove is bounded on the side nearer the nipple by an inclined wall 21, so that it is of trapezoidal shape in cross section.

The outer sleeve 22 is substantially cylindrical, and has an externally thickened portion 23 intermediate its ends, the inner surface of the sleeve at this thickened portion being conveniently formed with a plurality of circumferential grooves 24 separated by ridges 25. A second externally thickened portion 26 is formed at one end of the sleeve.

The end fitting is assembled on the hose by passing the hose end 14 through the sleeve 22, pushing the nipple 12 into the bore of the hose, and bringing the thickened end 26 of the sleeve 22 up against the shoulder on the main part of the end fitting formed by the reduction in diameter at 17. The reduced part 17 between the groove 18 and the nipple 12 is of a diameter substantially equal to that of the exterior of the hose 14, and the interior of the sleeve 22, and thus locates the latter.

The assembled fitting is then placed in a swaging die having a diameter slightly greater than that of the main part of the sleeve, and it is moved axially through the die by means of a suitable plunger engaging its outer end. The die compresses the two thickened portions of the sleeve inwardly, the ridges 25 inside the intermediate thickened portion being forced into the material of the hose to grip it firmly between the sleeve and the nipple, whilst the end thickened portion 26 is forced into the groove 18 on the main part of the end fitting, thus securing the sleeve 22 firmly to the latter. The external surface of the nipple 12 is preferably formed with circumferential ridges as shown on the drawing, to provide a good grip on the hose.

In another form of the invention illustrated in Figures 3 and 4 the main part of the end fitting resembles that above described, but is provided with a second groove 27 between the groove 18 adjacent the nipple end, and the hexagonal portion 16. A sleeve 28, divided longitudinally into two parts is formed with internal ridges 31 intermediate its ends, and with an inwardly directed flange 32 at one end. A further sleeve 33 of plain cylindrical form with one end tapered internally as at 34 is adapted to be drawn over the segmental sleeve by a convenient drawing

tool to compress the segmental sleeve 28 radially inwardly. The internal ridges of the segmental sleeve are forced into the material of the hose to grip the latter between the sleeve and the nipple, and the inwardly directed flange 32 of the sleeve 28 is forced into the groove 18 on the end fitting thus securing the sleeve 28 against longitudinal movement relative to the nipple. The end 34 of the outer sleeve is then peened over into the groove 27 on the main part of the end fitting to lock it in position. The split sleeve 28 may be in one piece with a single longitudinal split along its length, or may be in more than two pieces, and may be initially formed with a greater radius of curvature than it has when finally clamped in position, to reduce the likelihood of pinching the hose material between the parts as they are drawn together. The end of the sleeve 33 is shown in full lines in Figure 3 with its end peened over into the groove 27, and in chain dotted lines in its initial form.

In this second arrangement, the surrounding member by which the sleeve is compressed to grip the hose and secure the sleeve in position remains on the fitting to retain the parts in position and become an integral part thereof, instead of, as in the previous example, being a die through which the fitting is passed to permanently change the form of the sleeve. The second arrangement is consequently capable of being dismantled by the process of removing the peened-over end of the outer sleeve 33 and removing that sleeve. The remainder of the parts can be used again, with a new outer sleeve 33.

As the nipple is formed integral with the main body of the fitting, liquid is unable to find its way between these two parts and come into contact with the end of the hose. It has been found that if liquid does reach the end of the hose it saturates the cotton or other threads forming the reinforcement of the hose and tends to weaken them, and it is, therefore, a considerable advantage to ensure that no liquid can reach the exposed threads at the ends of the hose. Moreover, if the liquid flowing through the hose is at a high pressure, and can reach the end of the hose, it will tend to force the hose out of the end fitting, thus increasing the risk of failure of the hose.

The nipple may be separate from the main body of the end fitting, being for instance formed by a tube having an end flange, the tube being passed through the main body of the fitting from the outer end and its flange resting on a shoulder in the bore of the main body. The joint between the nipple and the main body of the hose end fitting may be rendered fluid-tight by soldering or brazing the nipple in place. For instance, the end face of the main body from which the nipple projects may be slightly countersunk around the aperture, the countersunk recess being filled with solder or spelter when the nipple is in place. The outer end of the main body may be internally threaded or externally threaded as required, or may take any other form convenient for the attachment of the hose to another component.

We are aware of Specification Nos. 540,491 and 540,492, which were not published until after the date of this application. The former claims " a hose coupling component suitable for use with medium or high pressure hose comprising a circumferentially continuous sleeve, a separately formed insert adapted to co-operate with the junction nut or other junction mechanism, and a flexible hose gripper between such sleeve and insert, the sleeve being contracted by radially closing dies so that the outer face of the insert and the inner face of the sleeve become axially interlocked at a point beyond the end of the hose, by a portion of the metal of the one part being forced into or around a portion of the metal of the other part, whilst the part of the sleeve surrounding the hose is similarly contracted by radial pressure to grip the hose firmly between sleeve and insert." We make no claim herein to couplings having their sleeve portions contracted by means of dies which are closed in radially towards one another. The latter of the above two specifications claims " a hose coupling component suitable for use with medium or high pressure hose comprising a flexible hose, a circumferentially continuous sleeve and an insert, characterised by the exterior of the sleeve being formed with an enlarged band, the maximum diameter of which is situated medially of the ends of the sleeve, which, when the sleeve is contracted on the insert by radially closing dies produces a primary zone of intense pressure, whose maximum is produced medially of such ends, and with a second enlarged band, separate from and of lesser diameter than the first band, which when the hose is contracted produces a zone of secondary pressure whose maximum is less than that of the first zone, such second band being situate around the insert and approximately opposite to the end thereof "; we make no claim herein to the use of such a combination of primary and secondary enlarged bands in connection with that part of the sleeve which is arranged to grip the hose.

Having now particularly described and ascertained the nature of our said inven-

tion and in what manner the same is to be performed, we declare that what we claim is:—

1. A hose end fitting of the kind referred to, in which the outer sleeve is circumferentially continuous and is formed with externally thickened portions extending circumferentially around it, one of said thickened portions being at one end and the other intermediate the ends, characterised by the fact that after the end fitting has been assembled on the hose the sleeve is passed axially through a swaging die to compress the thickened portions inwardly, one to grip the hose and the other to enter a circumferential groove in the main part of the end fitting and secure the sleeve thereto.

2. A hose end fitting of the kind referred to in which the outer sleeve which is split longitudinally and is formed with an inwardly directed flange at one end and with a series of internal ridges intermediate its ends, characterised by the fact that the outer sleeve is compressed radially inwardly on to the hose by means of a second sleeve forced longitudinally over it to cause the internal ridges to grip the hose and the end flange to enter the groove on the main part of the end fitting.

3. A hose end fitting, according to Claim 2, wherein the split sleeve is formed in at least two separate parts.

4. A hose end fitting, according to Claim 2 or 3, wherein the second sleeve is tapered internally at one end to enable it to be readily passed over the split sleeve.

5. A hose end fitting, according to any preceding claim, wherein the nipple is formed separate from the main part of the end fitting and is secured thereto by soldering, brazing or a like process.

6. A hose end fitting constructed and arranged substantially as described with reference to the accompanying drawings.

Dated this 4th day of February, 1941.

For the Applicants:
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